

Nothing is less in our power than the heart, and far from commanding we are forced to obey it.

Jean-Jacques Rousseau (1712–1778)

CHILDREN'S HEALTH

# Methylmercury and Children's Heart Function

Pregnant women who consume significant amounts of seafood may have a new reason to take precautions against methylmercury, the most hazardous form of mercury: a recent study suggests that when expectant women consume fish containing high levels of the toxicant, their children's future cardiovascular health may be jeopardized.

Fish and shellfish are the main sources of exposure to methylmercury for most Americans. Methylmercury tends to accumulate the most in large predatory species such as yellowfin tuna, shark, swordfish, and marlin. Other commonly eaten species can accumulate intermediate levels of methylmercury. Fish with the lowest mercury content include cod, flounder, salmon,

herring, and smaller tuna species that Americans buy canned.

In 1986, researchers led by Harvard environmental epidemiologist Philippe Grandjean and Faroese Hospital System chief physician Pal Weihe began a long-term study of mothers in the Faroe Islands and their children. The Faroese are among the world's leading seafood consumers per capita, with the average islander eating 2.4 ounces of fish per day. This diet exposes them to increased amounts of methylmercury.

Over a 21-month period, the researchers gathered a cohort of 1,022 women giving birth in the Faroe Islands. They tested mercury concentrations in the children by analyzing cord blood samples at birth and blood and hair samples taken at ages 7 and 14 years. They also measured the mercury in each woman's hair by taking a sample at the time of parturition.

In one of the latest papers to come from this study, published in the February 2004 issue of the *Journal of Pediatrics*, Grandjean and his

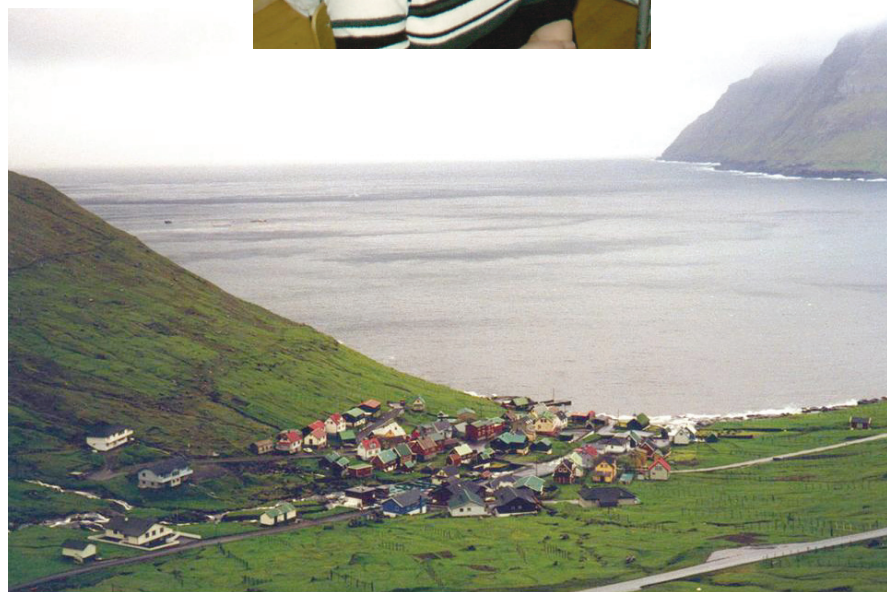
colleagues report that mercury which passed from mother to child *in utero*, first measured in cord blood, produced long-lasting harm to the child's neurologic mechanism that regulates heart function, as measured by heart rate variability. At higher mercury exposures, children were less capable of maintaining normal heart rate variability, which is a risk factor for development of heart disease. The decrease in heart rate variability at increasing mercury exposures was the steepest in the low range of mercury exposures, around the U.S. Environmental Protection Agency exposure limit. When the exposures increased above twice that limit, the effect was not as clear.

Very little is known about the impact of heart rate variability in children, except that children with congenital heart disease also have lower heart rate variability. Grandjean says, "The mercury-associated changes in the Faroe Islands study persisted at least to age fourteen, and it's possible that they are permanent. In adults, decreased heart rate variability is a known risk factor for heart disease mortality."

Alan Stern, an adjunct associate professor of public health at the University of Medicine and Dentistry of New Jersey, points out that because this effect is likely the result of developmental changes in the children's neurologic systems, it may be a sentinel for other neurophysiological disturbances. The developing brain is particularly vulnerable to methylmercury, and brain damage incurred during development is likely to be permanent.

However, Gary Myers, a pediatric neurologist who studies mercury exposure at the University of Rochester in New York, says that the Faroese are unusual in their diet of whale meat, which is especially high in concentrations of mercury and other toxicants. Therefore, he says, this study cannot be generalized to the United States and other countries with populations that do not consume whale meat.

But many Faroese do not eat whale, says Grandjean, and its availability varies seasonally and among communities. He says mercury associations found at low-exposure levels are more likely to be related to other kinds of seafood with high mercury concentrations. Still, he cautions that scientific conclusions should not be based on a single study. Moreover, consumers should not be scared away from eating seafood, but should instead be wary of fish with elevated mercury concentrations, particularly large predatory species. —John Tibbetts



**Skippping a beat.** New data from studies of children in the Faroe Islands exposed *in utero* to methylmercury show long-lasting effects on the neurological mechanism that controls heart rate variability.

## ASBESTOS

## Showdown in El Dorado

Taken at face value, northern California's El Dorado County has a lot going for it—the dramatic Sierra Nevada foothills scenery, lots of room for spacious new houses, and its short distance from Sacramento. That's why the population has nearly sextupled since 1960, according to U.S. Census figures. But the construction that is transforming this once rural area has also dug up a health risk—thin needles of amphibole asbestos, a particularly hazardous form of the mineral.

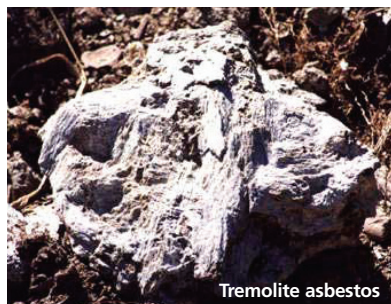
Naturally occurring amphibole asbestos is not a problem when left underground. But development can unearth the mineral, increasing the risk of exposure. In November 2003 the U.S. Environmental Protection Agency (EPA) found that over 25% of 153 soil samples collected from the local high school contained more than 1% asbestos by weight, a level that, if disturbed, could pose a threat to public health. As a result, the agency determined that additional investigations are required. This fall, officials from the EPA Superfund program plan to simulate the activities of school kids playing sports and use personal monitors to measure exposures associated with these activities at several locations including the high school, according to Superfund senior science advisor Richard Troast.

The monitoring comes in the wake of another town's recently publicized experience: occupational and environmental exposure to amphibole asbestos in the small mining town of Libby, Montana, resulting in deaths and other widespread health effects. There are lessons from Libby that apply to El Dorado, according to many asbestos experts. People with no occupational exposure, such as women who handled their miner husbands' work clothes, can have asbestos-related problems. Further, ambient air monitoring may not reflect actual asbestos exposure—individuals can dramatically heighten their exposure by kicking up fibers on the ground. So an accurate estimate of exposure requires personal air monitoring during specific activities.

In the April 2004 issue of *Occupational and Environmental Medicine*, a group of British researchers led by J. Corbett

McDonald reported their study of 406 Libby miners, in which they calculated that occupational exposure resulted in a 14% increase in mortality from all asbestos-related causes. They also estimated that environmental exposure for 50 years would lead to a 3.2% mortality increase and called attention to the potential health risk in northern California. Extrapolation is fraught with uncertainty, but for El Dorado's population of 160,000, such a mortality increase could translate into thousands of deaths.

A 2002 EPA peer consultation unanimously agreed that for mesothelioma, a rare cancer of the lining of the lung, the carcinogenic potency of amphibole fibers is a minimum of two orders of magnitude greater than for chrysotile asbestos fibers (most likely because amphibole fibers persist longer in the body). Forms of amphibole asbestos also can cause noncancer diseases in proportion to exposure, according to researchers led by Lucy Peipins of the Agency for Toxic



Tremolite asbestos

Substances and Disease Registry. They conducted a clinical study in which about 6,700 Libby residents had chest X rays. In the November 2003 issue of *EHP*, the researchers reported 29 exposure pathways related to work, recreation, and household activities.

The prevalence of pleural abnormalities increased with the number of exposure pathways, ranging from 6.7% for those who reported no apparent exposures to 34.6% for those who reported 12 pathways.

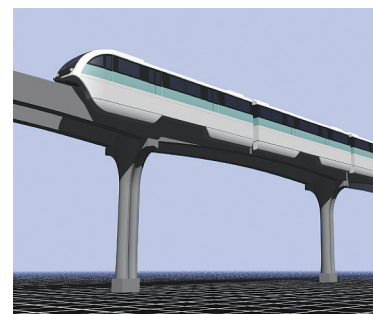
Some data already indicate that exposures in El Dorado are high enough to be harmful. When concerned citizens requested analysis of four deceased pets, the animals' lung fiber burdens revealed concentrations of amphibole fibers higher than those found in goats from Corsica, where episodic environmental exposure to amphibole asbestos is clearly associated with human mesothelioma, says pathologist Jerrold Abraham of Upstate Medical University. Working collaboratively, pathologist Bruce Case of McGill University confirmed these findings in an independent analysis. A summary of the study findings is available online at <http://www.asbestos.net/>.

What happens next in El Dorado will depend on the exposure monitoring data, says Troast. Some experts are braced for the worst. Says Case, "The situation in El Dorado has the potential to be the most important source of environmental asbestos-related mesothelioma ever in the United States." —Rebecca Renner

## Jakarta's New Monorail

Jakarta has begun a monorail project to combat the air pollution and massive traffic jams that plague the city of nearly 9 million people and 5 million vehicles. The monorail system, still in the planning phases, is expected to consist of two lines, one serving the Indonesian capital's central business district and the other running several miles through the city's outer areas. The city has also reserved two lanes of the city's main thoroughfare for bus traffic only.

Jakarta's air quality is ranked among the worst in the world. Studies have found that the sixth leading cause of death in Indonesia is inflammation of the respiratory tract, which is closely linked with poor air quality.



## U.S. Climate Changes

In August 2004, the Bush administration delivered a report to Congress acknowledging that emissions of greenhouse gases are the best explanation for the global warming trend of the past 30 years. The report, which is available on the Internet at <http://www.climatechange.gov/>, was prepared by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research, which are made up of federal representatives. The report also cited specific risks to farmers: increased carbon dioxide emissions stimulate the growth of invasive weeds, while reducing the nutritional value of certain grasses. Some industry groups dispute the new report, stating the science behind it is flawed.

## LA's Shipshape Terminal

The Port of Los Angeles is home to the world's first container terminal using Alternative Maritime Power (AMP) technology. Although this technology has been used by the U.S. Navy since World War II, the shipping industry has resisted adopting it due to cost and time issues.

AMP technology provides a dock with electricity that is converted to a ship-compatible voltage. Ships plug in to the dock instead of running their diesel engines during loading and unloading, cutting emissions of smog-forming nitrogen oxides by 1 ton and particulate matter by 87 pounds per day.

China Shipping Lines, which leases the new berth, has agreed to retrofit 11 of its ships for the new power source. The first vessel plugged in to the updated berth in June 2004.



**ALTERNATIVE  
MARITIME POWER**

## BIOINFORMATICS

## Literature Searchlight

The time and cost required to bring a new drug to market can exceed 10 years and \$800 million, according to the Tufts Center for the Study of Drug Development. Now researchers at etexx Biopharmaceuticals in Dallas, Texas, are using software that they say will slash this time and cost. How? By mining the medical literature for hints on new uses for drugs already approved by the Food and Drug Administration.

Repurposing existing drugs can offer substantial payoffs for both pharmaceutical companies and the public. For example, bupropion has been licensed separately as an antismoking drug (Zyban) and an antidepressant (Wellbutrin); Rogaine, now used to treat hair loss, was originally developed as a treatment for high blood pressure.

The software was created at The University of Texas (UT) Southwestern Medical Center by biochemistry professor Harold Garner and colleagues, and has been licensed to etexx, which Garner founded. Known as IRIDESCENT (for Implicit Relationship IDentification by in-Silico Construction of an Entity-Based Network from Text), the program allows full-scale automated analysis of records in MEDLINE, the National Library of Medicine's bibliographic database. Eventually the software could be used with other online resources such as the *Physicians' Desk Reference* and even internal documents from pharmaceutical and biotech companies.

The software analyzes MEDLINE abstracts to identify and evaluate statistical relationships among biomedical terms such as names of genes, phenotypes, drugs, and diseases. The program compares how often sets of these terms appear in texts relative to random probability. It can identify and compare over 300,000 different biomedical terms along with their spelling variations, synonyms, and acronyms. A network of these "co-mentions" is created and then analyzed by a statistical program to find indirect or implicit connections.

IRIDESCENT then scores the objects for relevance, significance, and interest, allowing the researcher to inspect the resulting connections to trigger hypotheses on new uses for existing drugs. The team showed the value of this approach by validating in several lab trials a connection between the drug Thorazine, used to treat psychotic disorders, and a reduction in the progression of cardiac hypertrophy, or enlargement of the heart, which the program had predicted. The results were published 12 February 2004 in *Bioinformatics*.

Besides conducting its own lab research on potential repurposed drugs, etexx will help pharmaceutical and genomics organizations sort through existing data and generate hypotheses from high-throughput data processes such as microarrays or proteomics mass spectroscopy analysis. "Everyone is trying to find ways to develop drugs cheaply," says Stephen Johnston, director of the UT Southwestern Center for Biomedical Inventions, which develops new drugs and procedures. "Garner has had very promising preliminary results." —W. Conard Holton

## ENVIRONMENTAL JUSTICE

## Young Hearts Suffer in Poorer Countries

Cardiovascular disease (CVD) is a well-known killer of older people in affluent countries. In developing countries, however, the disease is striking a younger age group. In India, South Africa, Brazil, and the Russian republic of Tatarstan, people aged 35–65 die from CVD significantly more often than counterparts in the United States, according to a report released recently by Columbia University's Earth Institute.

CVD is on the rise in developing nations for the same reasons that made it a killer in the west: a rise in cigarette smoking, a higher-fat diet, and lack of physical exercise. The CVD death rate in developing areas is reminiscent of that experienced in the United States in the 1950s and 1960s before effective public health measures, like warnings about the dangers

of smoking and treatment for hypertension, became common. But such measures "have not yet occurred in developing countries, and treatment is often unavailable," says epidemiologist Stephen Leeder of the University of Sydney in Australia, who coordinated the project while a visiting fellow at Columbia University.

Leeder's team combined available death rate and workforce data from five representative middle- and low-income regions to estimate the economic impact of CVD on society. Their report, released in April 2004, reveals a silent epidemic affecting both women and men of working age.

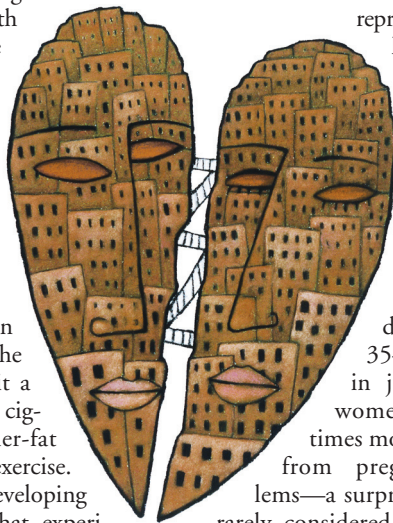
In Tatarstan, CVD deaths among men aged 35–64 have soared 70% in just 20 years. Among women aged 15–34, four times more die from CVD than from pregnancy-related problems—a surprise, given that CVD is rarely considered a woman's disease in developing nations. China's CVD death rate currently mirrors that of the United States but is expected to be twice the U.S.

rate by 2030, when half of the 9 million projected Chinese CVD deaths will be among people aged 35–64. In Brazilians aged 35–44, the male death rate from CVD is 30% higher and the female death rate 75% higher than for the same age group in the United States. In South Africa, CVD ranks third as cause of death in women and sixth for men.

The report's title, *A Race Against Time*, refers to a 20-year window of opportunity to tackle the problem. "Younger people can be educated about lifestyle changes and treated with drugs," says Leeder. If action is not taken now, the health costs in 20 years as these people reach end-stage disease "will be stupendous," he warns.

As world health organizations struggle to finance treatments for infectious diseases such as malaria and AIDS, the report reminds us that "we need to pay attention to chronic diseases like heart disease," says Daniel Fox, president of the Milbank Memorial Fund, which works with decision makers to bring the best available evidence to bear on health care and public health policy. The report is "analytically tight," says Fox, and suggests that the economic and social impact of heart disease in the next generation may dwarf that of communicable diseases.

—Carol Potera



ehpnet

## American Heart Association

Many diseases fall under the umbrella of "cardiovascular disease," including high blood pressure, cardiac arrhythmia, and congenital heart disease. These conditions affect young and old alike, as well as every ethnic group. In the United States, heart disease is the leading cause of death for both men and women. In 2004 alone, it is expected to cost the U.S. economy over \$238 billion in health care services, medications, and lost working hours. Since 1924 the American Heart Association (AHA) has been working to raise funds for heart disease research and to generate awareness among the general public about the seriousness of these diseases. The AHA website located at



<http://www.heart.org/> disseminates information about heart disease and the association's wide range of public information and continuing education programs.

A menu bar down the left-hand column of the homepage includes a pull-down listing of 10 diseases and conditions, which can then be selected for in-depth information. For example, the page on high blood pressure provides facts on the disease, ways to keep it in check, how to sign up for the AHA's monthly e-mail list service, and more. Visitors can also find information on risk factors, how a condition can affect health, and information geared toward medical professionals.

Another option on the menu bar leads to information on heart disease specifically in children. Along with a basic overview of childhood heart disease, this section includes in-depth pages on topics including DiGeorge syndrome, Kawasaki disease, and exercise for children. Also accessible from the children's section is HeartPower!, a free, downloadable curriculum devised to help teachers in grades pre-kindergarten through 8 teach their students about healthier lifestyles.

The Healthy Lifestyle link from the homepage leads to information on topics ranging from diet and nutrition to heart disease in women. Various pages provide tips on creating healthy eating habits, developing and maintaining food plans, reducing cholesterol, and keeping fit. The Health Tools portion of this section has a cardiovascular disease risk assessment tool; a family health history tree; and online logs for tracking blood glucose, blood pressure, cholesterol, and exercise.

The Publications section provides links to lists of AHA-produced consumer and patient education materials, many of which can be ordered for free. Visitors will also find a listing of AHA cookbooks (with sample recipes posted online) and other books on heart health. The AHA publishes five journals that also can be accessed online, as can a variety of other scientific publications, including Scientific Statements from the AHA, performance measures, and clinical data standards. The online Heart and Stroke Encyclopedia is available from the homepage as its own section.

Visitors to the homepage will find information on current events, and can search by zip code for nearby events and information on local AHA chapters. Many of the site's pages are available in Spanish, and can be accessed through the En Español link on the homepage. —Erin E. Dooley

## Rain Theft in China

With some agricultural areas of China in the grip of an extended drought, cities have turned to rain-making technology to extract precious water from the skies. Now neighboring cities in Henan province are accusing one another of an unusual crime: rain theft. In July 2004, Zhoukou city officials claimed that rain makers in Pingdingshan overseeded clouds so that the latter city enjoyed rainfall that should have been Zhoukou's. City officials want the courts to set up laws for "cloud farming," although scientists believe the technology is not yet proven enough to regulate.

China is one of the world's leading users of rain-making technology, which involves seeding cumulus clouds with dry ice or silver iodide to prompt precipitation. The Chinese government has set aside approximately US\$50 million for nationwide weather management systems. Many local and provincial governments have set up "weather modification" bureaus charged with cloud seeding.



## AHA Links Pollution to Heart Disease

In the 1 June 2004 issue of *Circulation*, the American Heart Association made its first firm policy statement linking heart disease and long-term exposure to air pollution. The statement, written by University of Michigan researchers, is based on an extensive literature review. It cites particulate matter such as that generated by traffic as especially dangerous. The statement also points to a clear association between secondhand tobacco smoke and heart disease. Lead author Robert Brook called the link between air pollution and heart disease "a serious public health problem" because of the large number of people affected and because exposure occurs over a lifetime.

## Seaweed Attacks DDT

An international research team funded by the Royal Thai government has found that applying powdered seaweed to soil contaminated with the pesticide DDT can accelerate the breakdown of the contaminant. DDT was widely used from its introduction in the 1940s until it was banned in the United States in 1972. It is still used for mosquito control in some countries where malaria is prevalent. The researchers, whose work appeared in the June 2004 issue of the *Journal of Chemical Technology and Biotechnology*, found that the optimal proportion of 0.5% seaweed by weight resulted in 80% of the DDT degrading within six weeks. The sodium in the seaweed loosens the soil, allowing microorganisms to reach and attack the DDT.

